316b Existing Facility Rule

Section 316(b) of the Clean Water Act

"Any standard …shall require that the location, design, construction, and capacity of the cooling water intake structures reflect the best technology available for minimizing adverse environmental impact."

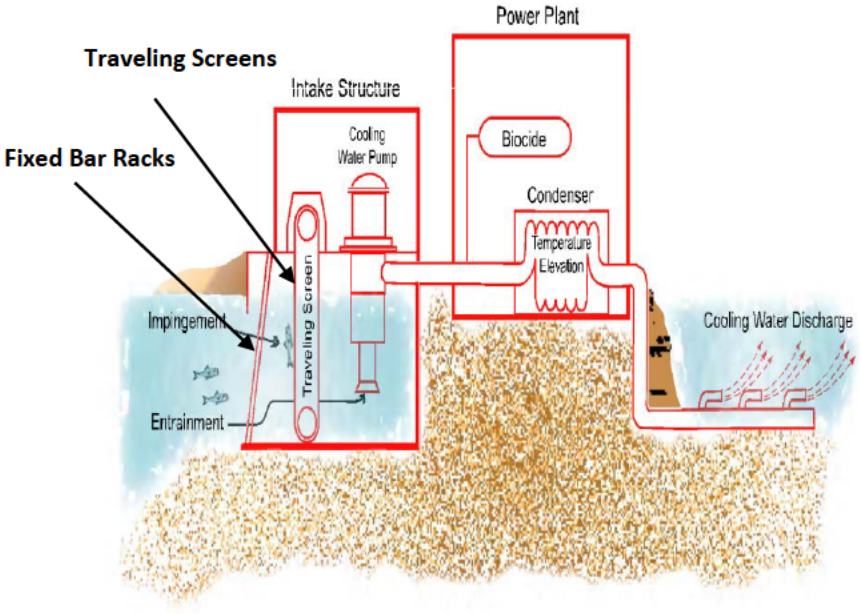
- *best technology available* often referred to as simply "BTA"
- not to be confused with effluent limitations guidelines *best available technology* or "BAT"

Current Implementation of 316(b) in NPDES Permits

[redacted]

- In the absence of national rules, EPA NPDES regulations require that permits address 316(b) on a case-by-case, best professional judgement (BPJ) basis
- [redacted]
- [redacted]
- [redacted]
  - [redacted]
  - [redacted]
  - [redacted]
- [redacted]

Background on 316(b) – terminology



Facilities withdraw 226 billion gallons of water per day for cooling; represent about half of all water withdrawals from US waters

- Most intakes use 3/8 inch mesh screens to protect the power plant
- Larger fish unable to swim away are **impinged** against screens and usually die (one-third of A1E).
- Smaller organisms that pass through the screens are **entrained** in the cooling system and also die (two-thirds of A1E).
- Smaller mesh size screens results in "**converts.**" Organisms that were formerly entrained now are impinged.
- EPA proposed to define impinged as larger than a 3/8 inch mesh.

*An **age-one equivalent** or **"A1E"** expresses losses of fish, eggs, and larvae in units of individual fish of age one, and provides a standard for comparing losses across species, years, and regions.

State of Technology

- Impingement controls
  - coarse mesh screens with modified ("fish friendly") fish returns
  - intake velocity controls (less than 0.5 feet/second)
  - offshore velocity caps are effective in some cases
  - diversion and behavioral technologies effective on selected species

- Entrainment controls
  - the most effective entrainment technology is flow reduction
  - flow reduction is usually achieved with closed-cycle cooling
    - dry closed-cycle cooling is 100% effective, uses no water, but is expensive and has a greater energy penalty
    - wet closed-cycle cooling is 95-98% effective, uses some makeup water to replace evaporative losses, and costs much less than dry cooling
    - variable speed drives can provide up to 10% flow reduction
    - Some facilities retrofit to cooling towers due to water scarcity or thermal discharge limits

- Power plants vs. manufacturers – no meaningful technology differences
  - however manufacturers do have more opportunities to reuse cooling water

Candidate Technologies for Reducing Impingement and Entrainment Mortality

Technology	Percent Impingement Mortality Reduction	Percent Entrainment Mortality Reduction	[redacted]
Closed-cycle: Dry Cooling	100%	100%	[redacted]
Closed-cycle: Wet Cooling	95-98%	95-98%	[redacted]
Closed-cycle: Wet cooling with phased in compliance (technology doesn't change, cost does)	95-98%	95-98%	[redacted]
Low Intake Velocity/Wedge Wire Screens/Coarse Mesh Screens	80+%	N/A	[redacted]
Fine Mesh Screens: 0.5 mm mesh	N/A	21%	[redacted]
Fine Mesh Screens: 2 mm mesh	N/A	16%	[redacted]

Proposed Existing Facility Rule – permit application

- All facilities must submit:
  - Source water physical data (water body type)
  - Cooling water intake structure data (location in water column, intake flows, operational parameters)
  - Impingement Mortality Reduction Plan (how facility intends to comply)
  - Source water baseline biological data (identify all life stages of all species in vicinity of the intake)
  - Cooling water system data (design flows, water uses, water distribution)
  - Performance studies (biological survival studies)
  - Operational status (individual operating unit status, production schedules, plans for expansion)

Proposed Existing Facility Rule – impingement mortality

- Numeric limits on impingement mortality based on modified, fish-friendly traveling screens
  - Monthly average of 31%
  - Annual average of 12%
  - Compliance can be met with any equivalent performing technology
- Compliance alternative -- reduce intake velocity to 0.5 feet/second
- For ocean or tidal water facilities -- reduce impingement mortality of shellfish at a minimum to a level comparable to that achieved by properly deployed and maintained barrier nets

Proposed Existing Facility Rule – entrainment study

- Facilities withdrawing 125 MGD or more (based on actual intake flow) must submit peer reviewed studies:
  - Taxonomic identification of all life stages (rule specifically states T&E species)
  - Biological study to characterize entrained organisms
  - Evaluation of available entrainment technologies
    - Must consider closed-cycle re-circulating systems (i.e., wet cooling towers)
    - Social costs and social benefits
    - Impacts from thermal discharges and water consumption
    - Impacts on energy reliability, air quality, safety, and noise
    - Land availability
    - Remaining useful life
  - Much of the submission needs to be peer reviewed

Why does the proposed rule require studies for entrainment?

- Best performing technology is closed-cycle cooling but other considerations may limit their applicability at some facilities in particular circumstances...
- Consequently, rejected as basis for national entrainment requirement based principally on four factors
  - Space
  - Remaining useful life
  - Air quality impacts
  - Energy reliability
- No other best performing technology was identified for a national standard
- Studies required to provide Permit Authority with information needed to make site-specific determinations

Scope – Entrainment study

- All facilities:
  - Director must make site-specific BTA determinations made
  - Director can require any facility to submit additional data
- 380 largest facilities (AIF > 125 MGD) must submit comprehensive studies
  - representing 90% of all cooling water withdraws
  - three-fourths of the 120 existing power plants with a design intake flow of less than 50 MGD already employ cooling towers
  - costing roughly $70 million in total

Very Important Considerations

- There is no universally applicable technology solution in between closed-cycle cooling towers and modified traveling screens.
- Not all screens are created equal.
- In some cases a behavioral technology can be tuned to a specific species of concern.

Smooth mesh screen with fish return bucket

Proposed Existing Facility Rule – Permit Authority /Director's Role

- Review and approve each facility site-specific listing of "species of concern"
- Director may request additional data / studies

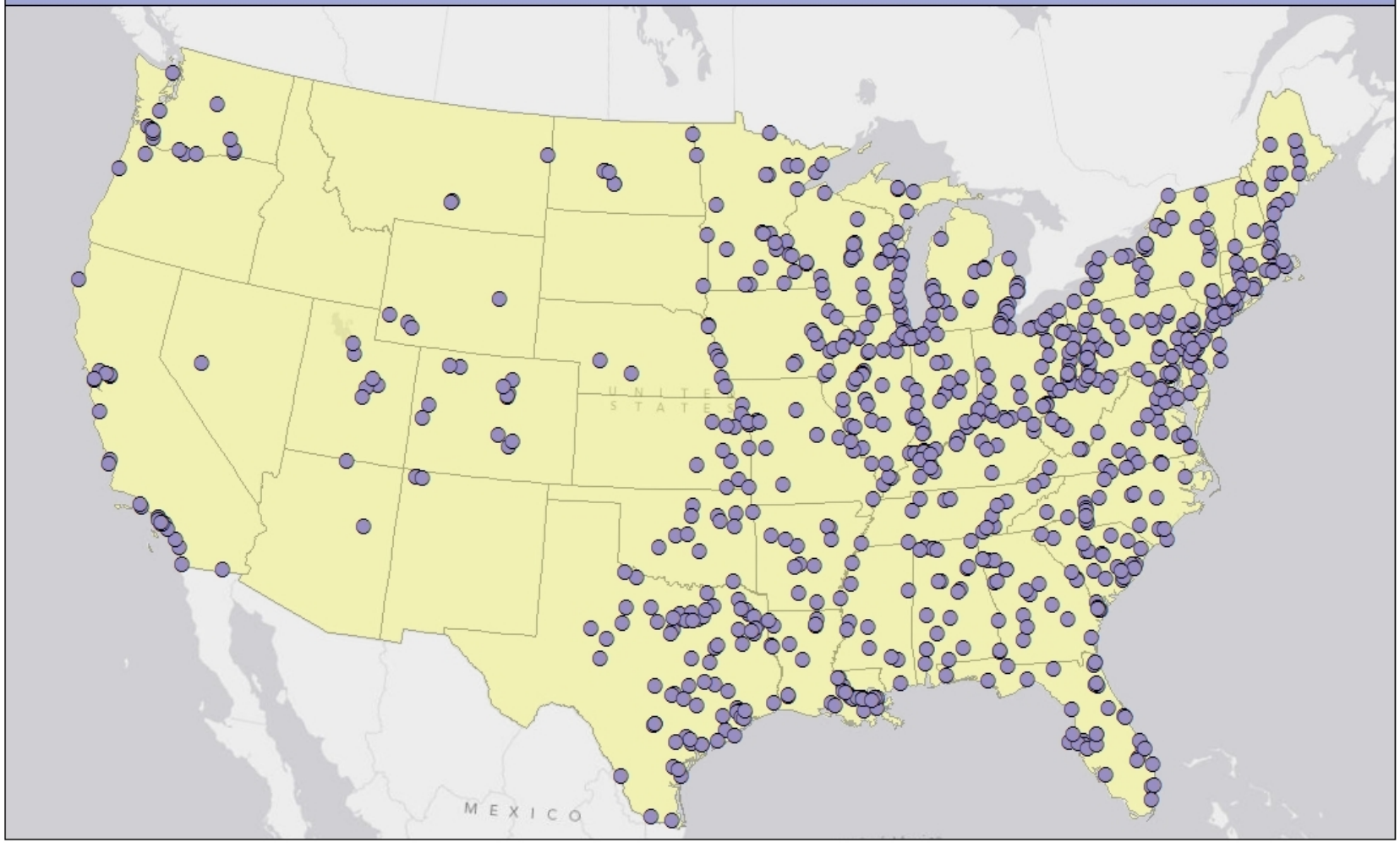
For the largest facilities required to conduct an Entrainment Characterization:

- Director may require additional peer reviewers
- Must make a site-specific BTA determination for entrainment – guided by whether social costs of entrainment technology are justified by the social benefits
- Must issue a written BTA determination (and make it publically available) based on consideration of at least the following factors:
  - Numbers and types of organisms entrained;
  - Entrainment impacts on the waterbody;
  - Quantified and qualitative social benefits and social costs of available entrainment technologies, including ecological benefits and benefits to any threatened or endangered species;
  - Thermal discharge impacts;
  - Impacts on the reliability of energy delivery within the immediate area;
  - Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
  - Land availability inasmuch as it relates to the feasibility of entrainment technology;
  - Remaining useful plant life; and
  - Impacts on water consumption.

Location Maps – Illustrating overlap with T&E species' critical habitat and habitat ranges

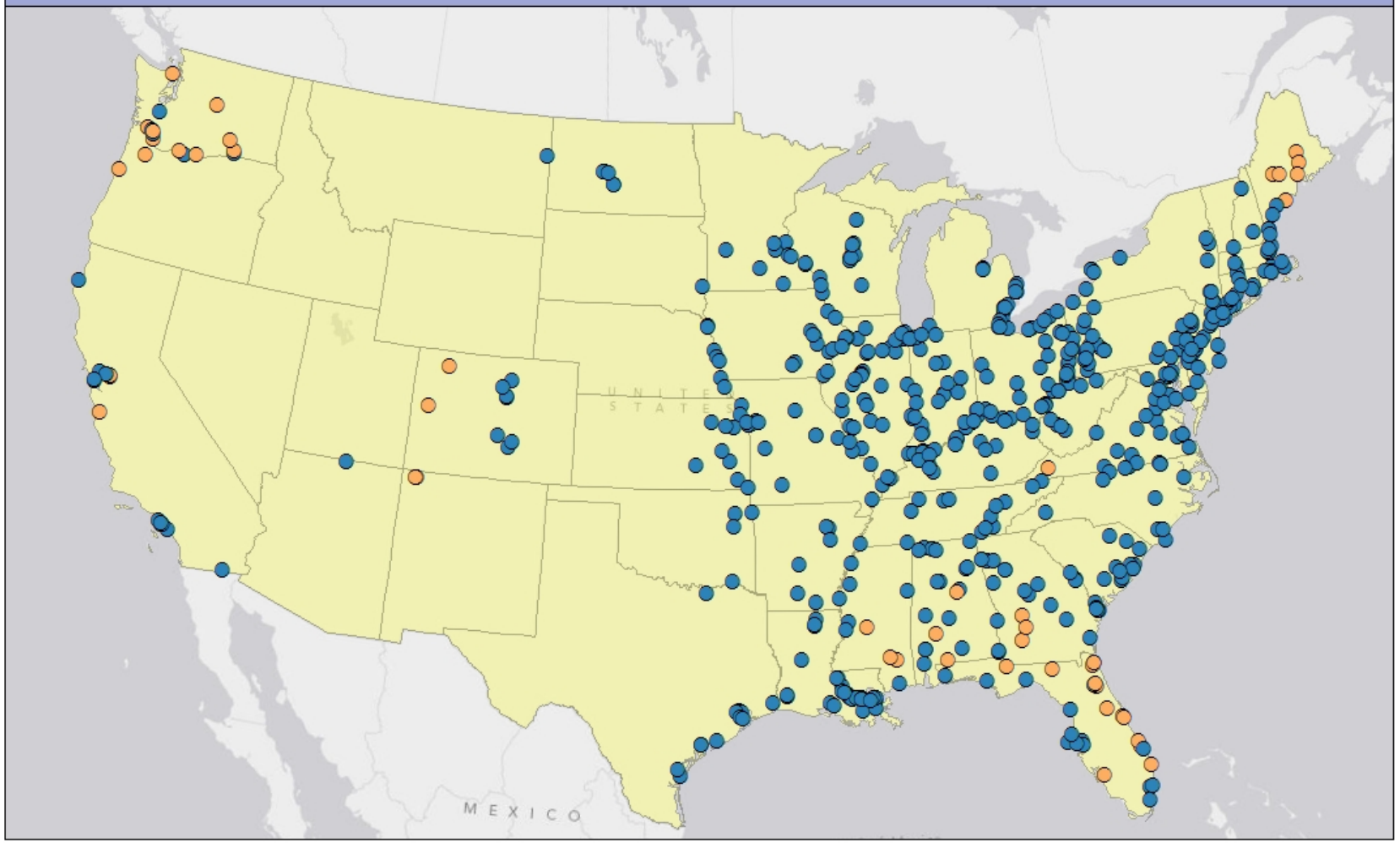
- Map 1: All 316(b) existing facilities for which EPA has location data
  - "Covered" facilities: 1,260 facilities withdrawing at least 2 MGD
  - Location data for 871 facilities (which is 897 intakes, some facilities have more than one intake)
- Subset of 316(b) existing facilities w/ location data – those Existing Facility Overlapping with T&E Species' Critical Habitat and Habitat Ranges
  - Map 2: Facilities overlapping T&E species' Critical Habitat and Habitat Ranges
  - Map 3: Facilities with cooling water intake flow over 125 MGD, and those below that threshold
    - I.e., Those facilities that, according to the proposed rule, would have to do entrainment studies (369 intakes); and those that would not (528 intakes)
  - [redacted]

1. All 316(b) Existing Facilities for Which EPA has Location Data



This map shows the 897 cooling water intakes at the 871 facilities for which EPA has location data. In addition to these facilities, EPA estimates that another 389 facilities, or a total of 1,260 facilities withdrawing at least 2 millions gallons per day, are covered by the April 2011 proposed rule.

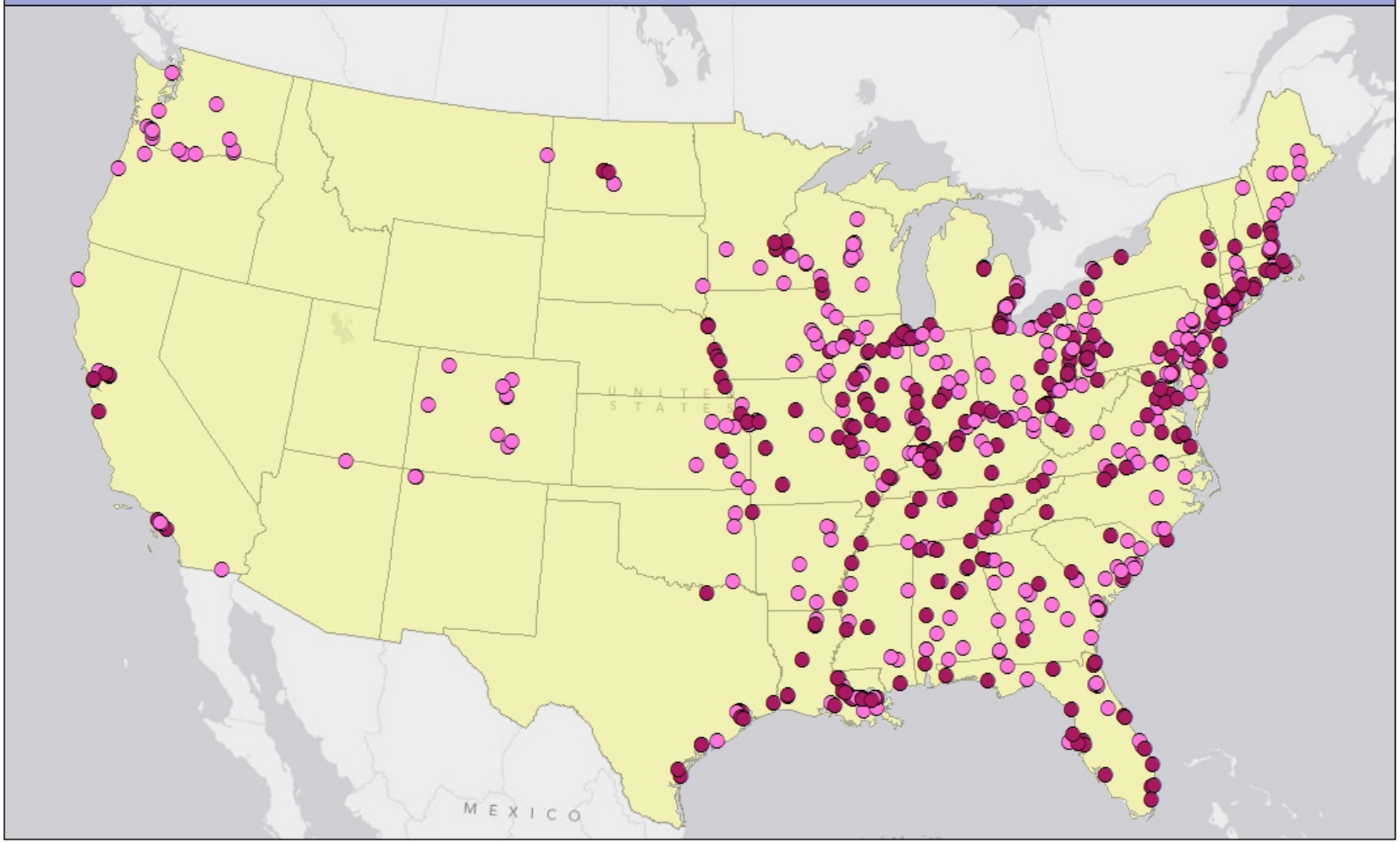
2. 316(b) Existing Facilities Overlapping with T&E Species' Critical Habitat and Habitat Ranges



- Cooling water intakes within Critical Habitat designated for one or more T&E species (50 intakes). Source: U.S. FWS/NOAA
- Cooling water intakes within the habitat range of one or more T&E species (647 intakes). Source: IUCN, Nature Serve, FWS and NOAA

Note: Critical Habitat and habitat range categories are not mutually exclusive. A total of 647 individual intakes overlap with habitat and/or critical habitat of T&E species.

3. Cooling Water Intake Flow at 316(b) Existing Facilities Overlapping with T&E Species' Critical Habitat and Habitat Ranges



Average Daily Cooling Water Intake Flow.
The April 2011 proposed rule would require entrainment studies at facilities withdrawing more than 125 million gallons per day (MGD).

- Cooling water withdrawl more than 125 MGD (275 intakes). Source: U.S. EPA, 316(b) Industry Survey, 2000.
- Cooling water withdrawl less than 125 MGD (372 intakes). Source: U.S. EPA, 316(b) Industry Survey, 2000.

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Proposed Regulation and [redacted]

PART 122 – EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM:

- **§ 122.21 Application for a permit**

PART 125—CRITERIA AND STANDARDS FOR THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM:

- § 125.90 Purpose of this subpart
- § 125.91 Applicability
- § 125.92 Special definitions
- § 125.93 Compliance
- **§ 125.94 Requirements reflecting best technology available for minimizing adverse environmental impact**
- **§ 125.95 Permit application and supporting information requirements**
- § 125.96 Monitoring requirements
- § 125.97 Record keeping and other reporting requirements
- **§ 125.98 Director**

Source Water Biological Characterization Data (pages 22276 & 22285)

- 122.21(r)(4) Source water baseline biological characterization data. The owner or operator of each facility must submit the following information in order to characterize the biological community in the vicinity of the cooling water intake structure and to characterize the operation of the cooling water intake structures. …The information you submit must include: … (iii) Identification of the species and life stages that would be most susceptible to impingement and entrainment.
- 122.21(r)(4)(vi) The information you submit must include: … (vi) Identification of all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at your cooling water intake structures;
- 125.95(b)(4)(iv)(C) You must submit documentation of the results of the Study to the Director. Documentation of the results of the Study must include:

  (1) Source Water Biological Study. If your new unit will use a new cooling water intake structure, you must update your Source Water Biological Study to include: … (ii) An identification of all threatened or endangered species that might be susceptible to entrainment by the proposed cooling water intake structure(s); and…

Entrainment Characterization Study (pages 22277-78)

- 122.21(r)(9)(i) The entrainment mortality data collection plan must include, at a minimum: …
  (E) The organisms to be monitored, including species of concern and threatened or endangered species;
- 122.21(r)(9)(iv) The Entrainment Characterization Study must include all of the following components:
  (A) Taxonomic identifications of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) that are in the vicinity of the cooling water intake structure(s) and are susceptible to
  (B) Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species), including a description of the abundance and...
  (C) Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species).

Peer Review
(page 22278)

- 122(r)(9)(ii) Obtain peer review of the entrainment mortality data collection plan. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final plan. Peer reviewers must have appropriate qualifications in biology, engineering, hydrology, or other fields and their names and credentials must be included in the peer review report.
- 122.21(r)(10)(iv) Obtain peer review of the comprehensive technical feasibility and cost evaluation study. You must select peer reviewers in consultation with the Director, including that the Director may require additional peer reviewers. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final study.

Director Discretion & Consultation (pages 22284 & 22286)

- 125.94 (f) More stringent standards. The Director may establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Director determines that your compliance with the applicable requirements of this section would not meet the requirements of applicable State and Tribal law, or other Federal law.
- 125.95(f) The Director has the discretion to request or determine additional information to supplement the permit application process, including inspection of the facility.

Director Requirements (pages 22287-88)

- 125.98(a) Permit application. The Director must review the materials submitted on a timely basis by the applicant under § 122.21(r) before each permit renewal or reissuance to determine compliance with all applicable requirements.
- 125.98(c) Species of concern. The Director must review and approve the species of fish and shellfish identified as species of concern,
- 125.98(e) At a minimum, the proposed determination in the fact sheet or statement of basis must be based on consideration of the following factors:
  (1) Numbers and types of organisms entrained;
  (2) Entrainment impacts on the waterbody;
  (3) Quantified and qualitative social benefits and social costs of available entrainment technologies, including ecological benefits and benefits to any threatened or endangered species;
  ...